

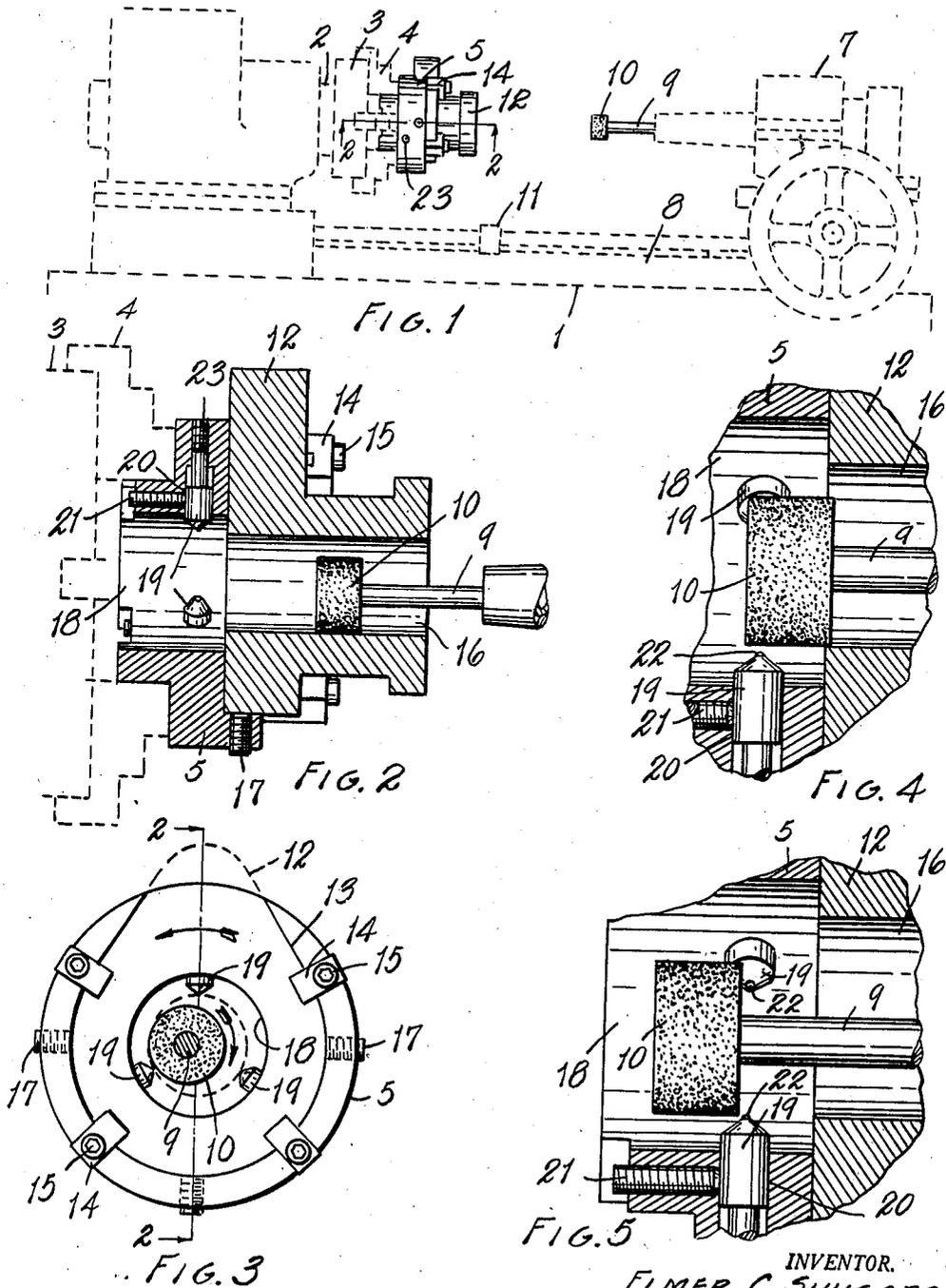
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PRECISION GRINDING MACHINE

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PRECISION GRINDING MACHINE

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This invention relates to improvements in precision grinding machines.

The main objects of this invention are:

First, to provide a precision grinding machine which after being adjusted for particular work may be operated by a relatively unskilled workman for the production of precision work.

Second, to provide a precision grinder having the advantages stated which is very easily adjusted for precision work.

Third, to provide a structure which may be readily adapted for embodiment in machines of different types such, for example, as lathes or grinders having head stocks provided with jaw chucks.

Fourth, to provide a means for dressing the grinding wheel and at the same time gauging the work for precision grinding.

Objects relating to details and economies of the invention will appear from the description to follow. The invention is defined and pointed out in the claims.

A preferred embodiment of the invention is illustrated in the accompanying drawing, in which:

Fig. 1 is a front elevation of a structure embodying the features of my invention, the machine parts being mainly shown by dotted lines and conventionalized.

Fig. 2 is an enlarged fragmentary sectional view on a line corresponding to line 2—2 of Fig. 1 with the grinding wheel in operative relation to the work, the head stock and chuck on the machine being illustrated by dotted lines.

Fig. 3 is an end elevation of the work holder with the grinding wheel shaft in section, the work being indicated by dotted lines.

Fig. 4 is an enlarged fragmentary section corresponding to that of Fig. 2 with the grinding wheel advanced substantially through the work into traversing relation to the dressing tool but out of dressing relation thereto which is the relation during the initial grinding, the clearance being exaggerated.

Fig. 5 is a view similar to Fig. 4 showing the grinding wheel in relation to the dressing tools at the finish or near the finish of the grinding operation.

My present invention is readily adaptable for use in machines of standard types such as a lathe or grinding machine and I have illustrated my invention as embodied in an attachment for such machines, but it should be understood that it is adapted for structural embodiment when the machines are manufactured. The work

holder illustrated is designed for cams but it will be understood that the work holder may be designed for any type or shape of work, that illustrated being designed only for internal grinding.

In the accompanying drawing, 1 represents the base of a grinding machine having a rotating head stock 2 provided with a chuck 3 having jaws 4. These jaws are adapted to clamp the work holder designated generally by the numeral 5. The tail stock 7 is reciprocatingly mounted and is adapted to be fed transversely of the table 8 relative to its path of reciprocation. The grinding wheel shaft or spindle 9 is carried by the tail stock, the grinding wheel 10 being mounted on the end of the shaft. A stop 11 limits the forward stroke of the tail stock.

The work holder 5 is provided with a suitable chuck for the work, the work 12 illustrated being a cam and the work holder having a recess 13 in the face thereof receiving the cam, the work being clamped in this recess by means of the clamps 14 and the clamp adjusting screws 15. The work holder is designed to support the work with its bore 16 in axial alignment with the axis of the head stock. A plurality of radially disposed set screws 17 coact with the clamps 14 in securely retaining the work. At the rear of or inner side of the work receiving recess, the work holder is provided with a bore 18 of a diameter exceeding the diameter of the bore of the finished work. The tail stock is reciprocated on each stroke to carry the grinding wheel through the work and into this bore 18.

I provide a plurality of grinder wheel dressing and work gauging tools 19, three being illustrated, these being disposed in radial bores 20 for adjustment therein and being secured in their adjusted positions by means of set screws 21. These tools are provided with diamond points 22. The dressing tools are preferably provided with adjusting screws 23 by means of which they may be very accurately adjusted.

In setting up for a particular piece of work, the dressing tools are adjusted so that their diamonds lie in a circle as is shown by dotted lines in Fig. 3. This is preferably accomplished by the use of a plug-like gauge which is the dimension of the internal surface or bore of the finished work, the plug-gauge being inserted and the dressing tools adjusted to bring their points into contacting relation to the gauge. It will be noted that the grinding wheel is of less diameter than the bore of the work and its

axis is escentric relative to the axis on which the work rotates.

In the ordinary installation, the work is driven in one direction and the grinding wheel in the reverse direction. For example, if the work is driven in a counter-clockwise direction the grinding wheel would be driven in a clockwise direction. It will also be noted that only one dressing tool contacts the grinding wheel in alignment with the contact of the grinding wheel with the work.

In the accompanying drawing, I have illustrated a work holder designed for cam-shaped work but it will be understood that the work holder may be designed for any type or shape of work and that while I have illustrated the diamond-pointed dressing tools, other types may be used.

In operation, the grinding wheel is moved forwardly or advanced to the work and preferably passed entirely therethrough on each stroke—that is, the stop is adjusted so that when the stop is reached the grinding wheel has passed entirely through the work and into the dressing bore or chamber. As the dressing tools are adjusted according to the internal diameter of the finished work, they do not contact the grinding wheel or are not in dressing relation thereto until the grinding has been practically completed. However, as the finish grinding point is reached, the grinding wheel comes into contact with the dressing tools on each stroke so that the dressing cams serve as work gauges. The operator will reciprocate the grinding wheel rapidly back and forth across the work without the grinding wheel coming into grinding contact with the work so that an effective gauge is provided. The last stroke also serves to true or dress the grinding wheel for the next piece of work.

I have illustrated and described my improvements in a very simple and practical embodiment thereof. I have not attempted to illustrate or describe other embodiments as it is believed that this disclosure will enable those skilled in the art to embody or adapt my invention as may be desired.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. The combination with a machine of the class described including a head stock provided with a work chuck and a reciprocable tail stock provided with a tool chuck and with lateral feed means, of a work holder adapted for mounting in said head stock chuck and to support work to be internally ground with its axis in alignment with the axis of the head stock, said work holder having a bore at the inner side of the work of a diameter substantially exceeding the internal diameter of the finished work, a plurality of diamond supporting posts provided with diamonds radially adjustable on said work holder to project into said bore thereof, means for securing said posts in predetermined adjusted positions within said bore, and a grinding wheel of less diameter than the internal diameter of the finished work carried by said tail stock and adapted to be reciprocated through the work in grinding relation thereto and in said bore into dressing relation with the diamonds whereby on the completion of the grinding of the work the grinding wheel dressing diamonds constitute gauges determining the internal diameter of the finished work.

2. The combination with a machine of the class described including a head stock provided with a work chuck and a reciprocable tail stock provided with a tool chuck and with lateral feed means, of a work holder adapted for mounting in said head stock chuck and to support work to be internally ground with its axis in alignment with the axis of the head stock, a plurality of diamond supporting posts provided with diamonds adjustably mounted on said work holder at the inner side of the work chuck thereof, and a grinding wheel of less diameter than the internal diameter of the finished work carried by said tail stock and adapted to be reciprocated through the work in grinding relation thereto into dressing relation with the diamonds whereby on the completion of the grinding of the work the grinding wheel dressing diamonds constitute gauges determining the internal diameter of the finished work.

3. The combination with a machine of the class described including a head stock provided with a work chuck and a reciprocable tail stock provided with a tool chuck and with lateral feed means, of a work holder adapted for mounting in said head stock chuck and to support work to be internally ground with its axis in alignment with the axis of the head stock, said work holder having a bore at the inner side of the work chuck of a diameter substantially exceeding the internal diameter of the finished work, a plurality of grinding wheel dressing tools adjustably mounted on said work holder to project predetermined distances into said bore thereof, and a grinding wheel of less diameter than the internal diameter of the finished work carried by said tail stock and adapted to be reciprocated through the work into grinding relation thereto and into dressing relation with the said dressing tools whereby on the completion of the grinding of the work the said dressing tools constitute gauges determining the internal diameter of the finished work.

4. The combination in a machine of the class described, of a rotatable work holder for work to be internally ground, a plurality of grinding wheel dressing tools adjustably mounted on said work holder, and an axially movable grinding wheel of less diameter than the internal diameter of the finished work and adapted to be reciprocated through the work in grinding relation thereto and into dressing relation with the said dressing tools whereby on the completion of the grinding of the work the said dressing tools constitute gauges determining the internal diameter of the finished work.

5. The combination in a machine of the class described, of a rotatably mounted work holder for work to be internally ground, said work holder having a bore at the inner side of the work mounted therein, said bore being of a diameter substantially exceeding the internal diameter of the finished work, a plurality of grinding wheel dressing tools adjustably mounted on said work holder to project into said bore thereof, and an axially movable grinding wheel of less diameter than the internal diameter of the finished work adapted to be reciprocated through the work in grinding relation thereto and in said bore into coacting relation to said dressing tools whereby on the completion of the grinding of the work the grinding wheel dressing tools constitute gauges determining the internal diameter of the finished work.

6. The combination in a machine of the class

described, of a rotatably mounted work holder for work to be internally ground, a grinding wheel dressing tool adjustably mounted on said work holder at the inner side of the work supported in said work holder, and a grinding wheel of less diameter than the internal diameter of the finished work adapted to be reciprocated through the work in grinding relation thereto and into coacting relation to said dressing tool whereby on the completion of the grinding of the work the grinding wheel dressing tool constitutes a gauge determining the internal diameter of the finished work.

7. The combination in a machine of the class described, of a rotatably mounted work holder for work to be internally ground, a grinding wheel dressing tool adjustably mounted on said work holder at the rear side of the work carried by the work holder, and a grinding wheel of less diameter than the internal diameter of the finished work, said work holder and grinding wheel being relatively movable to bring the grinding wheel into grinding relation to the work and thereafter into dressing relation to said tool, whereby the dressing tool constitutes a gauge limiting the grinding action of the grinding wheel on the work.

8. The combination in a machine of the class described, of a rotatably mounted work holder, a grinding wheel dressing tool mounted on said work holder at the rear side of the work carried by the work holder, and a grinding wheel, said work holder and grinding wheel being relatively movable to bring the grinding wheel and work

into grinding relation and thereafter bring the grinding wheel into dressing relation to said tool, whereby the dressing tool constitutes a gauge limiting the grinding action of the grinding wheel on the work.

9. The combination in a machine of the class described, of a rotatably mounted work holder, a grinding wheel, said work holder and grinding wheel being relatively movable, and a grinding wheel dressing tool adjustably mounted on said work holder at the rear of the work carried by the work holder whereby the dressing tool may be adjusted to dress the grinding wheel and thereby limit the action of the grinding wheel on the work.

10. The combination in a machine of the class described, of a work holder, a grinding wheel, said work holder and grinding wheel being relatively movable to bring the grinding wheel into grinding relation with the work carried by the work holder, and a grinding wheel dressing tool adjustably mounted on the work holder at the rear of the work carried thereby, the relative movement of said work holder and grinding wheel being such that the grinding wheel is brought into grinding relation with the work and thereafter moved across said dressing tool whereby on the completion of the grinding of the work the grinding wheel is brought into dressing relation with the grinding tool on each work stroke for limiting the grinding action of the grinding wheel on the work.

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